

NEW OF 727600







# Model TR-7600



OPERATING MANUAL



## INTRODUCTION

Your KENWOOD Model TR-7600 is an advanced 2-meter transceiver for amateur mobile, and optional fixed station operation.

The TR-7600 features:

- 800 channel PLL circuit.
- Digital Frequency Display.
- Memory TX and  $\pm 600$  kHz repeater TX OFFSET.
- PLL UNLOCK and ON AIR indicators.
- Sub Audible ON/OFF switch (Encoder user installed).
- Powered tone pad connector.
- Powered 5 Pin Mic connector.
- TX HI-LOW (Power) switch.

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# TR-7600 SPECIFICATIONS

## GENERAL

### Semiconductors:

Transistors 53

FETs 9

ICs 17

Diodes 85

### Frequency Range:

144.00 to 147.995 MHz

### Frequency Synthesizer:

Digital control of phase locked VCO

### Synthesizer Stability:

Less than  $\pm 750$  Hz at 25°C

### Mode:

FM

### No. of Channel:

800

### Operating Temperature:

-20 to +50°C

### Power Voltage:

11.5 VDC to 16.0 VDC

(13.8 VDC standard).

### Grounding:

Negative grounding

### Antenna Impedance:

50  $\Omega$

### DC Current:

Less than 0.5 A in receive with no input signal

Less than 3 A in HI transmit

Less than 1.5 A in LOW transmit

(at 13.8 VDC)

### Dimension:

161 mm (6-5/16") wide

61 mm (2-3/8") high

230 mm (9-1/16") deep

### Weight:

1.75 kg (3.85 lbs) Approx.

## TRANSMITTER SECTION

### RF Output Power:

High 10 watts (min.)

Low 1 watts approx. (adjustable to 10 watts)

### Modulation

Variable reactance direct shift

### Max. Frequency Deviation

$\pm 5$  kHz

### Spurious Radiation

Less than -60 dB

### Touch Tone Input Impedance

600  $\Omega$

### Microphone

Dynamic microphone with PTT switch, 500  $\Omega$

## RECEIVER SECTION

### Circuitry:

Double superheterodyne

### Intermediate Frequency:

1st IF 10.7 MHz

2nd IF 455 kHz

### Sensitivity:

Less than 0.4  $\mu$ V for 20 dB quieting

(Less than 1  $\mu$ V for 30 dB S/N)

Less than 0.25  $\mu$ V

### Squelch Sensitivity:

More than 12 kHz at 6 dB down

### Pass Band Width

More than 76 dB at 30 kHz of adjacent channel

### Selectivity (2 Signal)

More than 70 dB

### Image Rejection:

More than 60 dB

### Spurious Interference:

More than 66 dB

### Intermodulation:

More than 1.5 watts across 8  $\Omega$  load (10% distortion)

### Audio Output:

**NOTE:** Circuit and ratings may change without notice due to development in technology.



## SECTION 1. PREPARATION FOR USE

### 1.1 ACCESSORIES

Carefully unpack your TR-7600 Transceiver and check that it is supplied with the following accessories:

- (1) Dynamic microphone with plug..... 1 piece
- (2) Mounting bracket..... 1 assy.
- (3) Mounting parts
  - Screws, 6 mm diameter..... 4 pieces
  - Plain washers, 6 mm diameter..... 4 pieces
  - Spring washers, 6 mm diameter..... 4 pieces
  - Nuts, 6 mm diameter..... 4 pieces
  - Plain washers 4 mm diameter..... 4 pieces
  - Hexa-socket screw..... 4 pieces
  - Hexa wrench..... 1 piece
- (4) Spare fuse, 4A..... 1 piece
- (5) DC power cord with plug and fuse..... 1 piece
- (6) Miniature plug for external speaker..... 1 piece
- (7) Miniature plug for touch tone pad..... 1 piece
- (8) Operating manual..... 1 copy

### 1.2 ANTENNA

Any 50 ohm 2-meter antenna system may be used with your TR-7600. The 50 ohm coaxial cable should be kept as short as possible in order to minimize line loss. Attach a UHF type connector (PL-259) to the coaxial cable for easy connection to the receptacle on the transceiver.

### 1.3 INSTALLATION CAUTION

Your TR-7600 Transceiver should be securely mounted under the dashboard (or similar location) using the accessory mounting bracket and hardware. Improper installation may result in damage to the transceiver and or dashboard. Consideration should also be given to the dashboard material prior to installation. Detailed installation information will be found in SECTION 3.1, "MOBILE", page 6.

## SECTION 2. CONTROLS AND THEIR FUNCTION

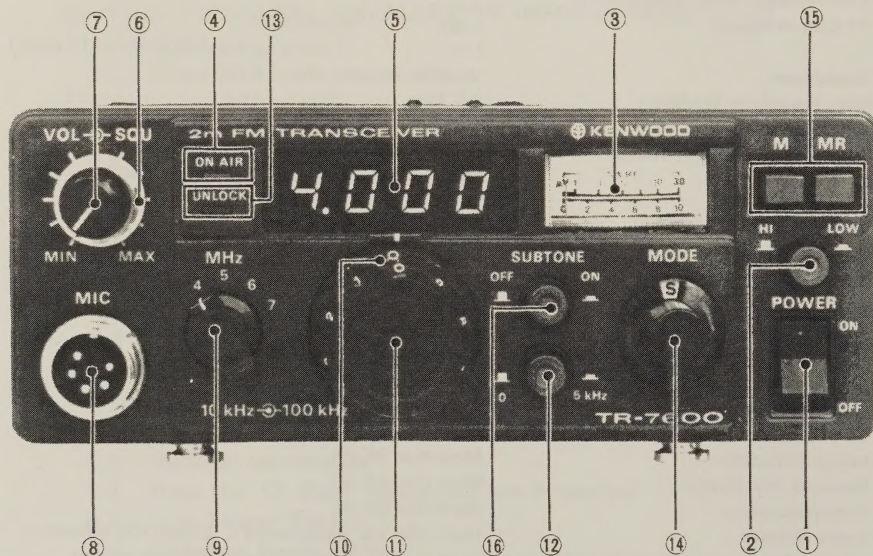


Fig. 2-1 Front Panel View

## 2.1 FRONT PANEL (Refer to Fig. 2-1)

- 1 POWER Switch**  
Turns power on.
- 2 HI/LOW Switch**  
High setting is full power output. Low setting, indicated by the meter illuminated green, is 1W (Nominal).
- 3 Meter**  
Indicates relative RX signal strength or TX output.
- 4 ON AIR Indicator**  
LED illuminates during transmit.
- 5 Digital Frequency Display**  
Indicates receive frequency in 4 digits.
- 6 SQU Control (Outer knob)**  
Used to silence receive noise at no signal condition. Adjust clockwise until the noise threshold is reached when no signal is present.
- 7 VOL Control (Inner knob)**  
An AF volume control used in the receive mode of operation. Volume increases (Clockwise).
- 8 MIC Connector**  
Low-impedance input and PTT terminal for MIC connection, plus pin 3 powered during TX.
- 9 MHz Selector Switch**  
Used to select the desired band. (144, 145, 146, 147 MHz indicated as 4, 5, 6 or 7).
- 10 100 kHz Selector Switch (Outer knob)**  
Used to select a desired channel in units of 100 kHz.
- 11 10 kHz Selector Switch (Inner knob)**  
Used to select a desired channel in units of 10 kHz.
- 12 5 kHz Offset Switch**  
Used to select the least significant digit, of the channel frequency 0 or 5 kHz.
- 13 UNLOCK Indicator**  
LED indicates PLL unlock state. RX, TX functions cease. For details, see page 9.
- 14 MODE Switch**  
Shifts the transmit frequency for repeater operation.

- ⊕ Switches the transmit frequency UP 600 kHz from the receive frequency.
- S Simplex the receive and transmit frequencies are the same.
- ⊖ Switches the transmit frequency down 600 kHz from the receive frequency.
- M The transmitter operates on a preset frequency, while the receiver is controlled by the selector switches.

### 15 Memory Switch

By pressing the M Switch, the frequency displayed on the Digital Frequency Display is preset. When the MR Switch is depressed, the preset frequency is selected. This frequency is displayed on the Digital Frequency Display.

### 16 SUBTONE Switch

The subtone switch activates an optional (ME-3 type) Subtone Oscillator.

## 2.2 REAR PANEL (Refer to Fig. 2-2)

### 17 DC Power Connector

Accepts DC operating voltage through the supplied power cord.

### 18 TONE PAD Connector

A tone pad input for "Autopatch" operation. Plug supplied. (Refer to Section 4-10, page 9)

### 19 EXT SP Connector

External AF output (8 ohm).

### 20 Remote Control Switch

This switch is used to supply backup power to the remote controller and the internal memory.

### 21 Remote Connector

For connection of the remote control.

### 22 Heat Sink

Radiates heat produced by the final transistors.

### 23 ANT Connector

For connection of any 50 ohm 2-meter antenna. Accepts PL-259.

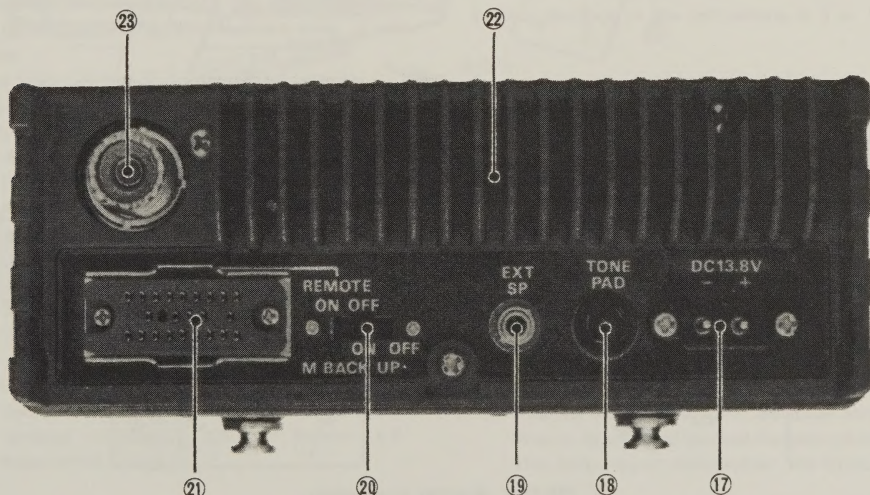


Fig.2-2 Rear Panel View

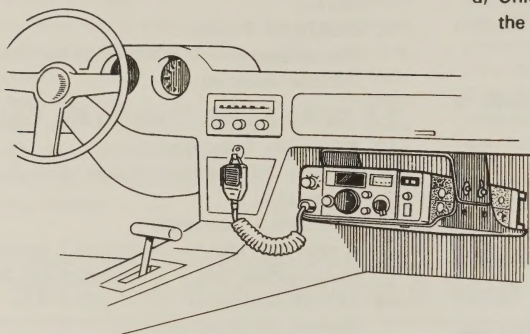


## SECTION 3. GENERAL INSTALLATION INFORMATION

### 3.1 MOBILE

#### 1. Installation Position

Your TR-7600 may be installed under the dashboard for convenient operation. Be sure that its position does not restrict your leg movement to the brake pedal. A typical installation is shown in Fig. 3-1



#### 2. Installation (Fig. 3-2)

##### IMPORTANT

The TR-7600 is designed for a negative ground installation.

- Securely install the mounting bracket with supplied hardware.
- Insert the transceiver into the mounting bracket.
- Adjust the angle for the desired position of the transceiver. This assures operating convenience and safety while driving.
- Unfold each snap lock, hook on the pawl, then clamp the snap lock.

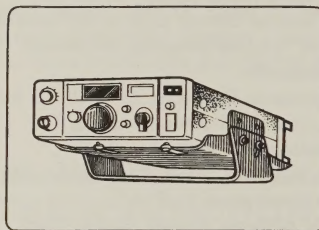


Fig. 3-1 Typical Mobile Installation

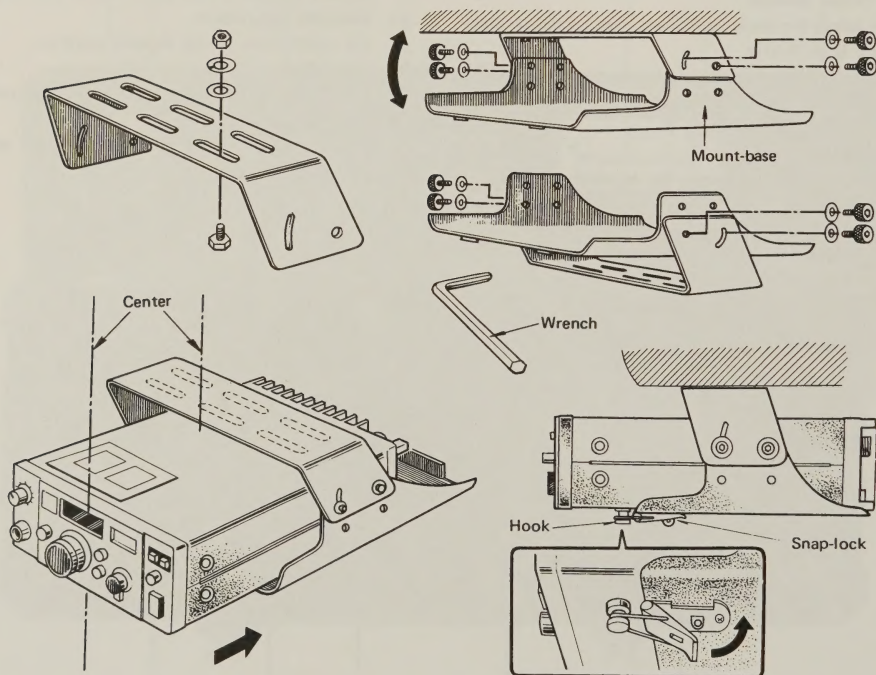


Fig. 3-2 Bracket Installation



### 3. Connecting the Power Supply

Connect the supplied power cable securely from your transceiver to the battery terminals, or accessory position on the fuse block. Make certain that the red lead is connected to the POSITIVE (+) post and the black lead the NEGATIVE (−) post. Route the cable carefully to prevent future problems of shorting, etc.

#### NOTE:

1. The power cable should be as short as possible.
2. An alternative way of obtaining power is to use the cigarette lighter. A plug, as shown in Fig. 3-3 is available at auto accessory shops or electronics parts stores.

### 3.2 FIXED-STATION

The TR-7600 is designed so as to be used with a DC power supply having a current capacity of around 3A at the rated operating voltage of 13.8V.

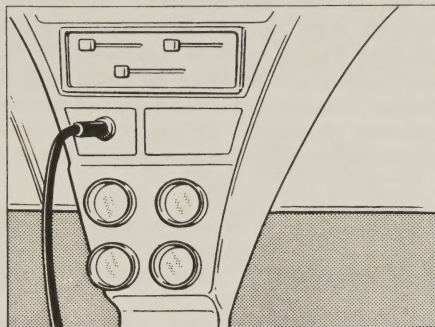


Fig. 3-3 Use of Cigarette Lighter

## SECTION 4. OPERATION

### 4.1 RECEIVING

1. Connect the supplied power cable to the DC power connector and the antenna cable to the ANT connector. Select a DC power supply or battery pack having 3 to 4A current capacity at 13.8V.

#### CAUTION:

Make certain the POSITIVE (+) and NEGATIVE (−) power cable leads have been connected properly.

2. Turn the POWER Switch ON ①. The digital frequency Display ⑤ will indicate frequency and the meter 3 will illuminate.
3. Turn the SQU Control ⑥ fully counterclockwise.
4. Turn the VOL Control ⑦ clockwise until the noise comes up to a comfortable level.
5. Set the MHz, 100 kHz and 10 kHz Selector Switches ⑨, ⑩, ⑪, and 5 kHz Offset Switch ⑫ to the receive frequency. If an incoming signal is received, the Meter ③ will indicate signal strength.
6. To eliminate the noise heard with no signal input, gradually turn the SQU Control ⑥ clockwise until the internal noise quiets.

#### NOTE:

Your transceiver is normal if the UNLOCK Indicator on the front panel lights momentarily during frequency selection. For more detailed information, refer to Section 4.8, "UNLOCK INDICATOR", page 9.

### 4.2 TRANSMITTING

1. Plug the supplied microphone into the MIC Connector ⑧.
2. Set the MODE Switch to "S".
3. Set the MHz, 100 kHz and 10 kHz Selector Switches ⑨, ⑩, ⑪, and 5 kHz Offset Switch ⑫ to a desired channel.
4. Depress the microphone push-to-talk switch to place the TR-7600 in the transmit mode. The ON AIR Indicator ④ will light and the meter ③ will indicate RF output power.
5. Ideal distance to the microphone is 5 to 10 cm.

#### NOTE:

It is recommended that the antenna system SWR be 1.5: 1 or less.

Transmit power will be reduced by the protection circuit if the SWR is too high. The Meter ③ should read 7~9 when operating high power (10 watts) into a 50 ohm load. The antenna system is acceptable if the meter reads this value. (The meter, in this sense, acts as an SWR indicator.)

### 4.3 MODE SWITCH

The MODE Switch, ⑭ used mainly for repeater operation, has four positions:

- S: Your TR-7600 operates in the usual simplex mode. That is, receive and transmit frequencies are the same. This frequency is indicated on the Digital Frequency Display ⑤.

- ⊕: The receiver frequency is as indicated on the Digital Frequency Display ⑤, but the transmitter frequency is 600 kHz higher than indicated.
- ⊖: The receiver frequency is as indicated on the Digital Frequency Display ⑤, but the transmitter frequency is 600 kHz lower than indicated.
- M: With the Mode Switch in the M position, transmit frequency is preset by the Memory Switch ⑮, and the frequency is displayed on the Digital Frequency Display. In receive mode, the selector switches control operating frequency. To preset the transmit frequency, refer to Section 4.5 "Memory Switch".

#### NOTE:

1. If the transceiver is keyed to transmit without presetting the M frequency, the Digital Frequency Display will indicate " " mark or a Random display.

#### NOTE:

2. The MR Switch will not function at the M position. In this position, the preset frequency is not available when the MR Switch is depressed.

#### CAUTION:

1. When using the MODE Switch ⑭ ⊕ or ⊖, exercise care not to transmit out of the 144 to 148 MHz frequency band.
2. The ⊕ position on the MODE switch functions only on the 146 MHz and 147 MHz bands.  
The ⊖ position functions on all four bands.

## 4.4 HI/LOW POWER SWITCH

QSO Between locals can be enjoyed with less interference and power consumption by reducing the RF output power. This is accomplished by depressing the HI/LOW Switch ②, which reduces power from 10W to 1W. Power indication will drop to approximately "3" on the Meter ③.

## 4.5 MEMORY SWITCH

The Memory Switch is used to preset any desired channel within the 144.000 MHz to 147.995 MHz range.

Set the controls to the desired frequency. Press the (non-lock) M Switch. The frequency displayed on the Digital Frequency Displays is now preset.

To operate on this preset frequency, depress the MR Switch. The preset frequency is available regardless of the position of the Digital Frequency Display.

Repeater operation on the preset frequency is also possible.

#### NOTE:

With the Mode Switch ⑭ is the M position, the preset frequency is not available when the MR Switch is depressed.

## 4.6 REMOTE CONTROL SWITCH

This switch is used to supply backup power to the remote controller and the internal memory.

**Back up power:** When the power switch is turned OFF, the internal memory also turns OFF. With backup power applied, the memory remains ON even when the front panel power switch ① is turned OFF.

**REMOTE ON:** When connecting the remote control, set the switch to ON. If the remote control is not connected and the switch ⑳ is set to ON, the Digital Frequency Display ⑤ will go off and the UNLOCK ⑬ will come on. In this position, the memory remains ON when the front panel power switch ① is OFF, provided that the external DC power remains ON.

**REMOTE OFF:** When the Remote Control is not installed, set the switch ⑳ to OFF. This is the normal operating position. When external DC power is connected, the preset frequency is stored even if the front panel power switch ① is OFF.

\* When using external DC power, ⑬ maintain 13.8V DC.

**M BACK UP OFF:** In this position, the preset frequency is lost when the front panel power switch is turned OFF, even if the external power remains ON.

## 4.7 REMOTE CONNECTOR

This is for connection of the Remote Control.

The output of each terminal is shown in Table (4-1).

NO.	SIGNAL
1.	CB 13.8 VDC
2.	O2
3.	52 } Ok. 5k Select
4.	U2 UNLOCK
5.	SC SQUELCH
6.	SB STANDBY 13 VDC
7.	6S 146,147 Select
8.	4S 144, 145 Select
9.	T9 9 VDC TX
10.	E GROUND
11.	NC OPEN
12.	B MEMORY 13.8 VDC
13.	CM Center Meter
14.	P32
15.	P31 } MHz BCD
16.	P10
17.	P11
18.	P12 } 10kHz BCD
19.	P13
20.	P20
21.	P21
22.	P22 } 100 kHz BCD
23.	P23
24.	P30 MHz BCD

Table 4-1.

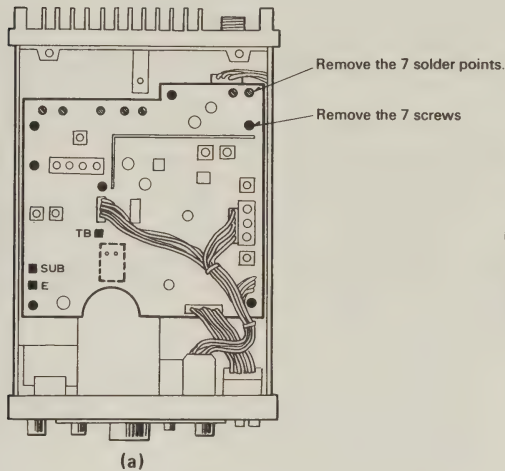


## 4.8 UNLOCK INDICATOR

If the frequency selector switches are improperly positioned, or the PLL has malfunctioned, the UNLOCK LED indicates transceiver protection. Transmit and receiver functions cease until the trouble is cleared.

### NOTE:

The UNLOCK indicator normally lights at turn on, and when the frequency selector switches are adjusted.



## 4.9 SUBTONE SWITCH

Your TR-7600 has a SUBTONE SWITCH pre-wired for use with tone encoder. To install, refer to Fig. 4-1.

1. Remove 7 screws, and 7 connectors.
2. Remove the 7 solder points as shown in Fig. 4-1 (a).
3. Install the tone unit on the printed circuit board and solder the ground pin from the foil side. Fig. 4-1 (b)
4. Solder the leads as illustrated in Fig. 4-1 (c).

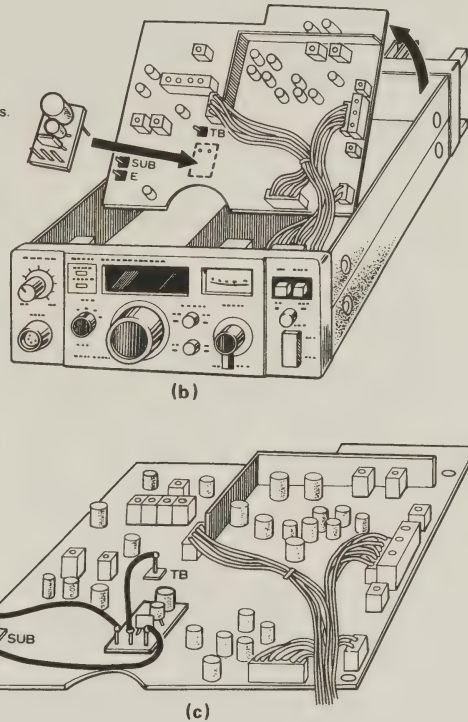
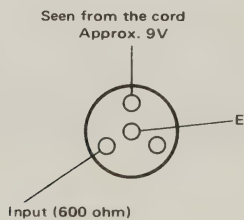


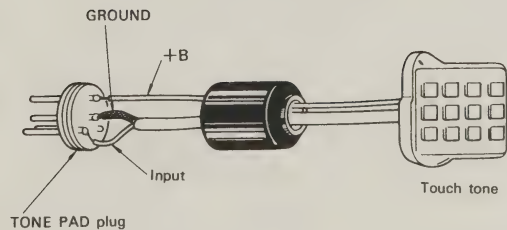
Fig. 4-1

## 4-10 TONE PAD INPUT

The TR-7600 has a 600 $\Omega$  tone pad input for "Auto patch" operation.



(a) TONE PAD Connector



(b) Connection of Touch Tone

Fig. 4-2

## SECTION 5. ADDITIONAL INFORMATION

### 5.1 GENERAL INFORMATION

Your TR-7600 has been factory aligned and tested to specification before shipment. Under normal circumstances, the transceiver will operate in accordance with these operating instructions.

If your transceiver fails to work, contact the authorized dealer from which you purchased it for quick, reliable repair. All adjustable trimmers and coils in your transceiver were preset at the factory and should only be readjusted by a qualified technician with proper test equipment. Attempting service or alignment without factory authorization can void the transceiver's warranty.

### 5.2 HOW THE TX FINAL TRANSISTORS ARE PROTECTED

Final transistor protection is provided by sampling the reflected power. As the reflected power is increased (higher SWR) the voltage to the driver transistors is reduced, thus decreasing input to the final transistors. This in turn reduces collector loss, protecting the final transistors.

### 5.3 LOW POWER SET-UP

Adjustment for Low Power is VR9 on the TX-RX Unit, X44-1300-10.

### 5.4 ORDERING SPARE PARTS

When ordering replacement or spare parts for your equipment, be sure to specify the following:

Model and serial number of your transceiver, Schematic number of the part, Printed circuit board number on which the part is located, Part number and name, if known, and Quantity desired.

#### NOTE:

A full service manual is available as a separate publication.

### 5.5 SERVICE

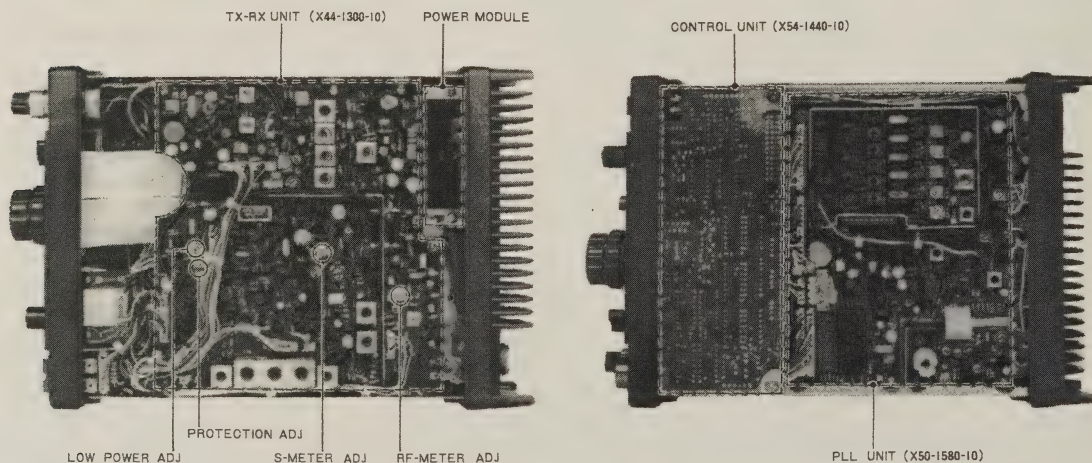
Should it ever become necessary to return the equipment for repair, pack in its original box and packing, and include a full, detailed description of the problems involved.

You need not return accessory items unless they are directly related to the service problem.

#### NOTE:

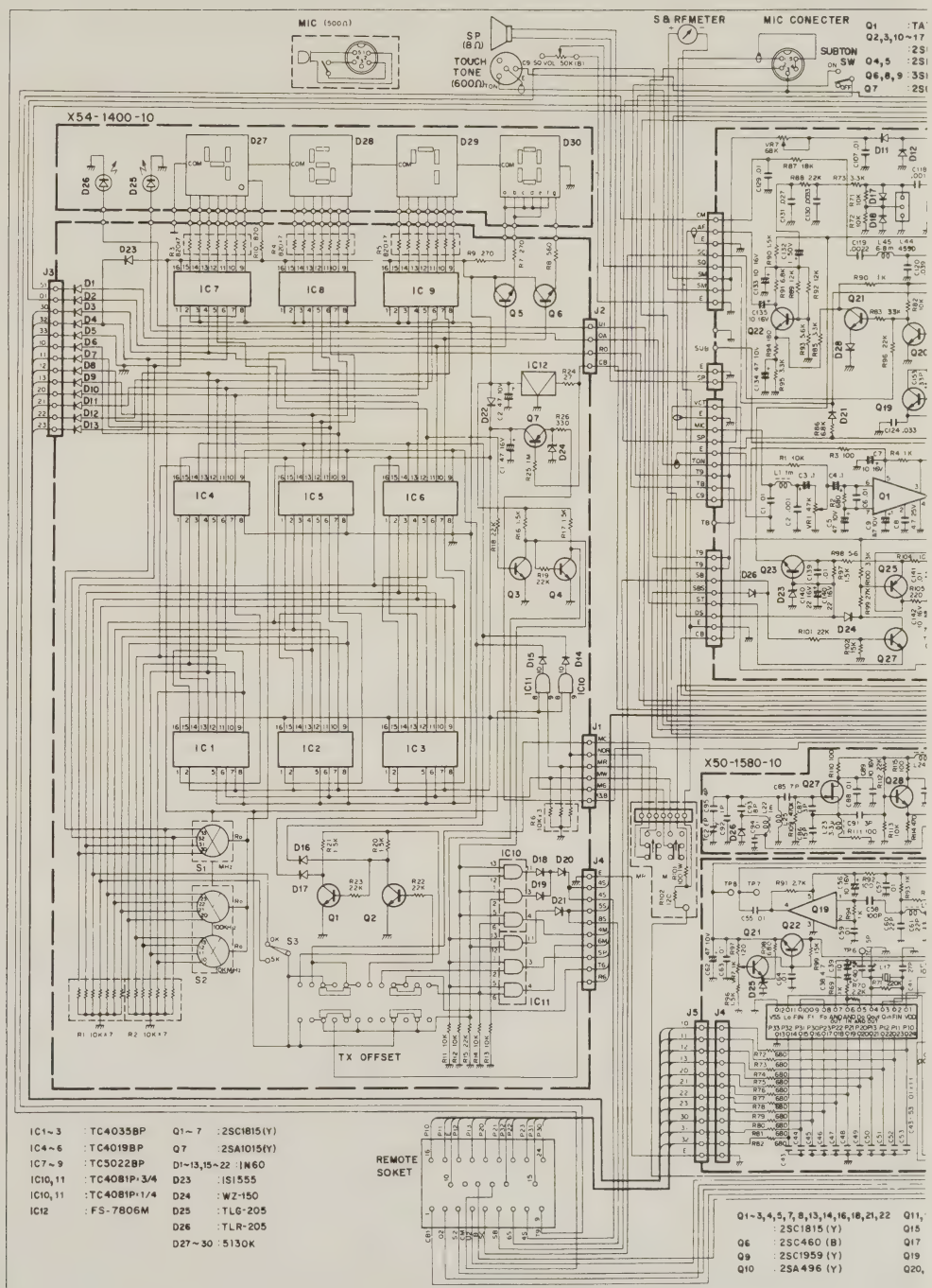
When claiming warranty service, please include a photocopy of the bill of sale, or other proof of purchase showing the date of sale.

## TOP AND BOTTOM VIEW OF THE TR-7600





# TR-7600 SCHE



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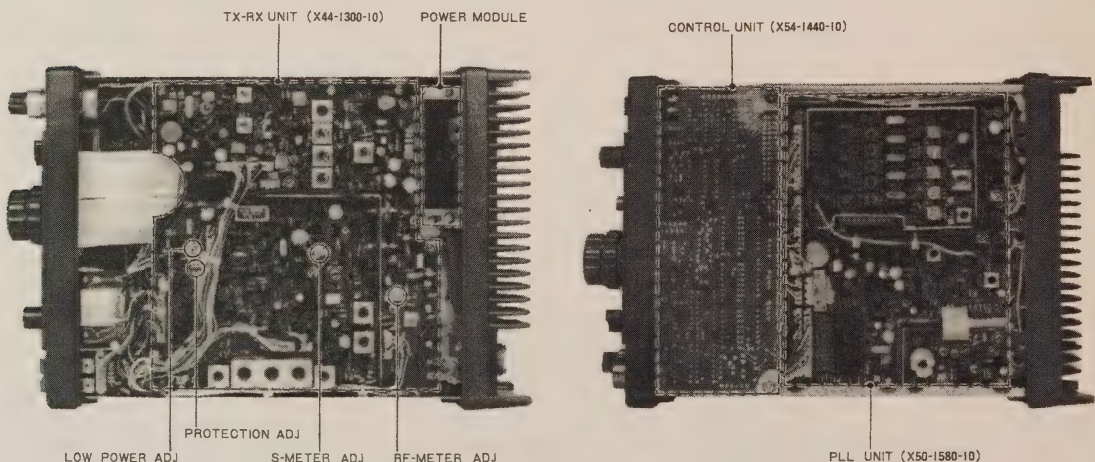
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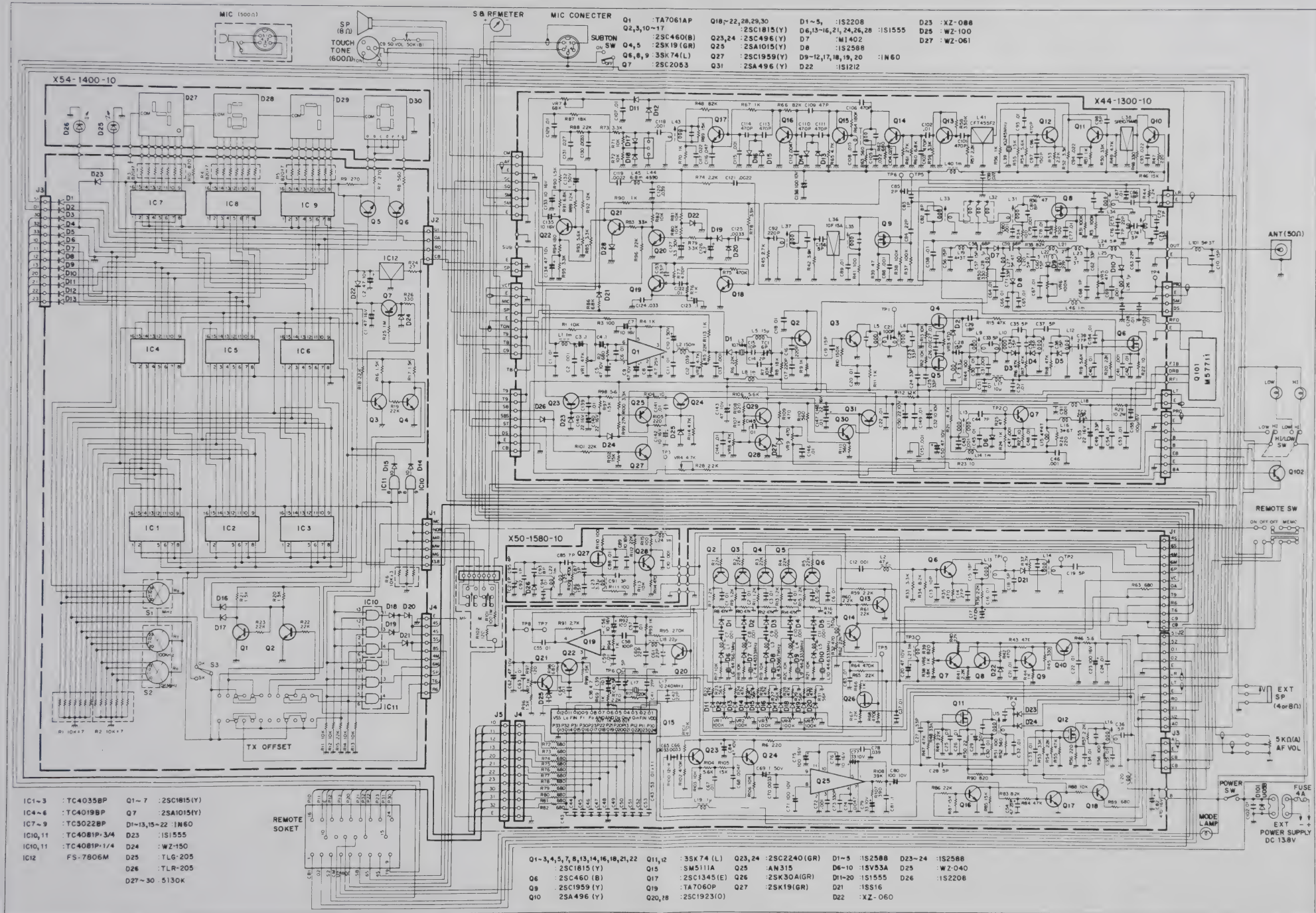
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## TOP AND BOTTOM VIEW OF THE TR-7600





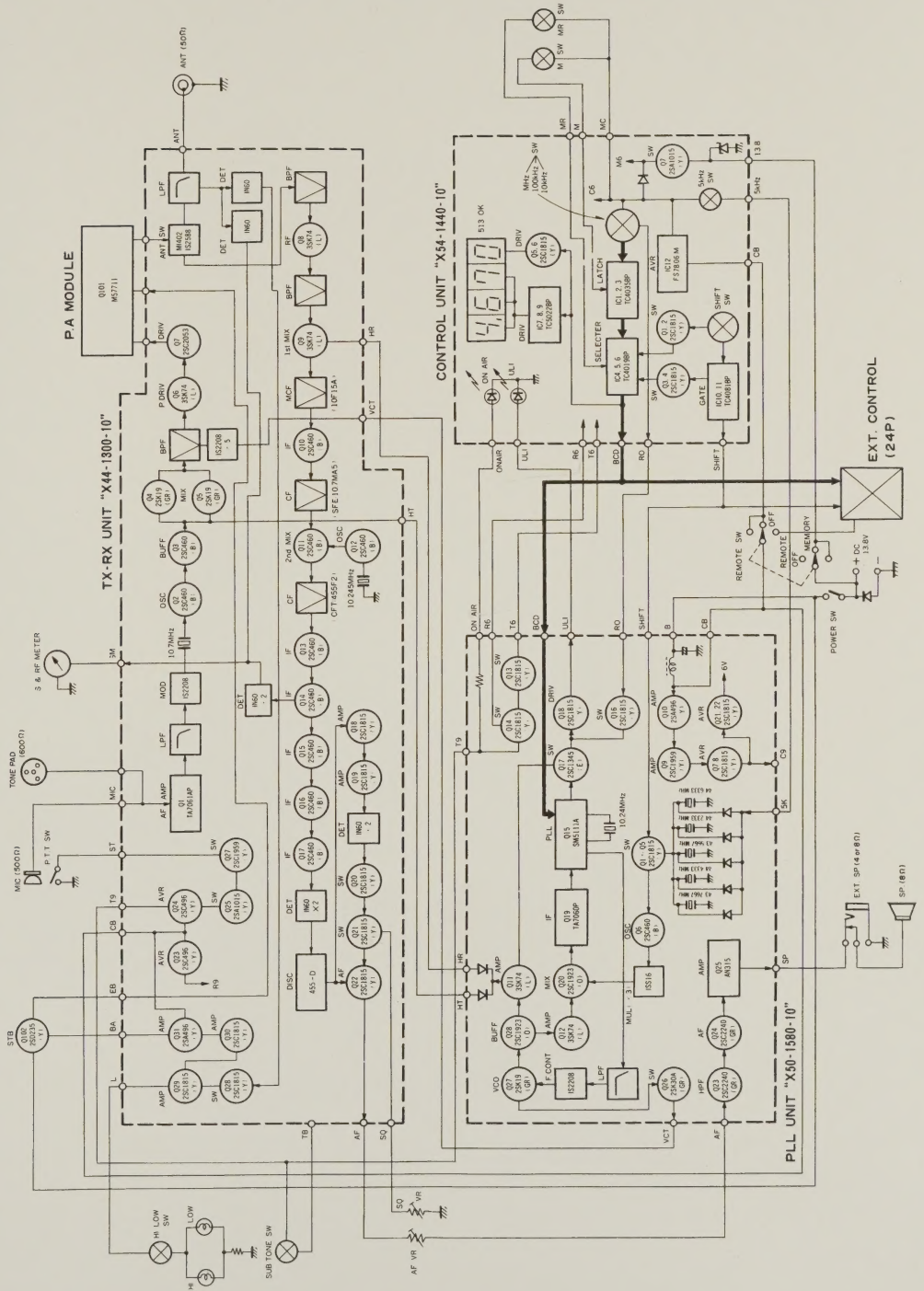
# TR-7600 SCHEMATIC DIAGRAM







# BLOCK DIAGRAM



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A product of  
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